PATENT

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Applicant:	DAVIS et al.	Examiner:	SCHLIE, P. W.
Serial No.:	10/777,531	Group Art Unit:	2186
Filed:	February 12, 2004	Docket No.:	**SJO920030064US1** (IBMS.074-0526)
Title:	METHOD AND APPARATUS FOR AGGREGATING STORAGE DEVICES		

PRELIMINARY AMENDMENT

Mail Stop RCE
Commissioner for Patents
P.O. Box 1450
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Dear Sir:

In response to the Office Action dated June 23, 2006, Applicants request Continued Examination (RCE) under 37 C.F.R. § 1.114 of the above-identified application. The following amendments and remarks are presented for consideration of the application.

Amendments to the claims begin on page 2 of this paper.

Remarks begin on page 10 of this paper.

IN THE CLAIMS

This listing of claims will replace all prior versions, and listings, of claims in the application:

1-35. (Canceled)

36. (New) A package for providing high density storage, comprising:

a hard disk carrier housing configured for insertion within a disk array chassis and for holding multiple hard disk storage devices proximate to one another; and

a hard disk carrier access device, disposed within the hard disk carrier housing, for structuring access to physical addresses of the multiple hard disk storage devices within the hard disk carrier housing and providing access to each of the multiple hard disk storage devices within the carrier housing over one connection.

37. (New) The package of claim 36, wherein the hard disk carrier access device further comprises an address aggregator for aggregating the physical addresses of the hard disk storage devices within the hard disk carrier housing into logical addresses and making the logical addresses of the hard disk storage devices within the hard disk carrier housing available over one connection.

38. (New) The package of claim 37, wherein the address aggregator is configured to present the hard disk storage devices within the hard disk carrier housing as a single storage device.

39. (New) The package of claim 37, wherein the address aggregator is configured to allowing each of the hard disk storage devices within the hard disk carrier housing to be addressed individually using logical addresses.

40. (New) The package of claim 36, wherein the hard disk carrier access device is configured to enable partial population of the hard disk carrier housing with hard disk storage devices so that hard disk storage devices are capable of functioning when the hard disk carrier housing is not fully populated with hard disk storage devices.

41. (New) The package of claim 36, wherein the hard disk carrier housing further comprises fault indicators for allowing notification of an inoperable hard disk storage device within the hard disk carrier housing.

42. (New) The package of claim 36, wherein the hard disk carrier housing further comprises internal connectors for connecting internal devices, wherein the internal connectors are configured for at least one type of technology selected from the group consisting of serial advanced technology attachment (SATA), serial attached SCSI (SAS), or Fibre Channel.

43. (New) The package of claim 36, wherein the hard disk carrier access device provides failure mode data for indicating a type of problem.

44. (New) The package of claim 36, wherein the hard disk carrier housing further comprises a spring-loaded bracket for holding each hard disk storage device in place.

45. (New) The package of claim 36, wherein the hard disk access device further comprises a controller for virtualizing the logical addresses of the hard disks storage devices within the hard disk carrier housing as at least one aggregate volume to provide a layer of abstraction to the hard disk storage devices within the hard disk carrier housing.

46. (Currently Amended) A package for aggregating electronic devices comprising:

means for use in a hard disk array chassis and for holding multiple hard disk storage devices proximate to one another; and

means, coupled to the means for holding, for structuring access to physical addresses of the multiple hard disk storage devices within the means for holding and providing access to each of the multiple hard disk storage devices over one connection.

47. (Currently Amended) The package of claim 46, wherein the means for structuring further comprises means for virtualizing the logical addresses of hard disk storage devices within the means for holding as at least one aggregate volume to provide a layer of abstraction to the hard disk storage devices within the means for holding.

48. (Currently Amended) The package of claim 46, wherein the means for structuring further comprises means for aggregating the physical addresses of the hard disk storage devices within the means for holding into logical addresses and making the logical addresses available over one connection.

49. (New) A storage system, comprising:

a plurality of hard disk carrier packages for providing high density storage, each hard disk carrier package comprising

a plurality of hard disk storage devices;

a hard disk carrier housing for holding the multiple hard disk storage devices proximate to one another; and

a hard disk carrier housing access device, coupled to the hard disk carrier housing, for structuring access to physical addresses of the multiple hard disk storage devices within the hard disk carrier housing, the hard disk carrier housing access device further providing access to each of the multiple hard disk storage devices within the hard disk carrier housing over one connection and implementing a desired package level storage configuration;

a disk array chassis for holding the plurality of the hard disk carrier packages for providing high-density storage;

a package aggregator, coupled to the plurality of hard disk carrier packages, for providing connections to each of the plurality of hard disk carrier packages for power, control and signaling; and

a system level controller, coupled to the plurality of hard disk carrier packages, for implementing a desired system level storage configuration.

50. (New) The package of claim 49, wherein the hard disk carrier housing access device further comprises an address aggregator for aggregating the physical addresses of the hard disk storage devices within the hard disk carrier housing into logical addresses and making the logical addresses of the hard disk storage devices within the hard disk carrier housing available over one connection.

51. (New) The storage system of claim 50, wherein the address aggregator is configured to present the hard disk storage devices within the hard disk carrier housing as a single storage device.

52. (New) The storage system of claim 50, wherein the address aggregator is configured to allowing each of the hard disk storage devices to be addressed individually using logical addresses.

53. (New) The storage system of claim 49, wherein the system level controller is configured to provide logical volume aggregation across the plurality of hard disk carrier housing packages.

54. (New) The storage system of claim 53, wherein the system level controller presents a desired RAID configuration across the aggregated hard disk carrier housing packages.

55. (New) The storage system of claim 49, wherein the system level controller presents a desired system level RAID configuration across the plurality of hard disk carrier housing packages.

56. (New) The storage system of claim 49, wherein the hard disk carrier housing access device further comprises a hard disk carrier housing package controller for virtualizing the logical addresses of the hard disk storage devices within the hard disk carrier housing as at least one aggregate volume to provide a layer of abstraction to the hard disk storage devices within the hard disk carrier housing.

57. (New) The storage system of claim 56, wherein the system level controller presents a system level RAID configuration across the plurality of hard disk carrier housing packages and each hard disk carrier housing package controller presents a hard disk carrier housing package level RAID configuration across the plurality of hard disk storage devices within each of the hard disk carrier housing.

58. (New) A method for providing high density storage, comprising:

holding multiple hard disk storage devices proximate to one another in a hard disk carrier housing configured for insertion as a hard disk carrier package within a disk array chassis;

structuring access to physical addresses of the multiple hard disk storage devices within the hard disk carrier housing; and

providing access to each of the multiple hard disk storage devices within the carrier housing over one connection.

59. (New) The method of claim 58, wherein the providing structured access to physical addresses of the multiple storage devices within the hard disk carrier housing over one connection further comprises aggregating the physical addresses of the hard disk storage devices within the hard disk carrier housing into logical addresses and making the logical addresses of the hard disk storage devices within the hard disk carrier housing available over one connection.

60. (New) The method of claim 58, wherein the providing structured access to physical addresses of the multiple hard disk storage devices within the hard disk carrier housing over one connection further comprises virtualizing the logical addresses of the hard disk storage devices within the hard disk carrier housing as at least one aggregate volume to provide a layer of abstraction to the hard disk storage devices within the hard disk carrier housing.

61. (New) The method of claim 60 further comprising:

providing a plurality of the hard disk carrier housings holding a plurality of hard disk storage devices;

providing access to each of the multiple hard disk storage devices within a hard disk carrier housings over one connection to implement a desired package level storage configuration for each of the hard disk carrier housings;

providing a system level controller for implementing a desired system level storage configuration across the plurality of the hard disk carrier housings.

REMARKS

In response to the Office Action dated June 23, 2006, Applicants request Continued Examination (RCE) under 37 C.F.R. § 1.114 of the above-identified application. Claims 1-35 have been canceled and new claims 36-61 have been added. Claims 36-61 are pending in the application.

In paragraph 4 on page 2 of the Office Action, claims 1-35 were rejected under 35 U.S.C. § 102(b) as being anticipated by or, in the alternative under 35 U.S.C. § 103(a) as obvious over Krum et al.

Applicants respectfully traverse the rejections, but in the interest of expediting prosecution have canceled claims 1-35.

Krum et al. teach a chassis for holding a plurality of hard disk. The chassis includes a RAID controller to provide logical addresses for the plurality of hard disk provided by the hard disk carriers.

However, Krum et al. fail to suggest a hard disk carrier housing holding a plurality of hard disk storage devices that is configured for insertion in a disk array chassis. Krum et al. merely shows a chassis that allows individual disk drives to be inserted or removed.

Krum et al. also fail to suggest a hard disk carrier access device for structuring access to physical addresses of the multiple hard disk storage devices within the hard disk carrier housing and providing access to each of the multiple hard disk storage devices over one connection. Krum at al. discloses a system level controller that aggregates the addresses of the drives in the chassis. Krum et al. does even mention providing multiple hard disk storage devices within a single hard disk carrier housing that is configured for insertion in a chassis. Krum does not even contemplate the need for a hard disk carrier access device for structuring access to physical addresses of the multiple hard disk storage devices within the hard disk carrier housing.

Moreover, because only provides a chassis for holding carrier housing that contain only a single hard disk storage device, Krum et al. can only provide RAID configuration at the system level (chassis level). The RAID controller 30 of Krum et al. is connected to a host interface bus. Thus, the RAID controller 30 only provides system level RAID configuration. In contrast, invention as recited in the claims of the present application provides both system level RAID and package level RAID.

Accordingly, Krum et al. fail to disclose, teach or suggest the invention as described in the new claims.

On the basis of the above amendments and remarks, it is respectfully submitted that the claims are in immediate condition for allowance. Accordingly, reconsideration of this application and its allowance are requested.

If a telephone conference would be helpful in resolving any issues concerning this communication, please contact Attorney for Applicant, David W. Lynch, at 423-757-0264.

Respectfully submitted,

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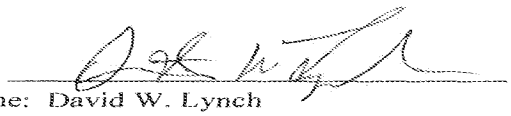
By: 
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